Amendments to the Drawings:

In FIG. 4, there is a spelling mistake in the label for reference number 104. Specifically, the phrase "Smooth the Normalized Raw Image Date" should read "Smooth the Normalized Raw Image Data". In other words, the word "Date" should be "Data." The attached replacement drawing sheet includes the above change to FIG. 4. The replacement drawing sheet, which includes FIG. 4, replaces the original drawing sheet including FIG. 4. The attached annotated drawing sheet shows the changes made to FIG. 4.

Attachments: Replacement Sheet and Annotated Sheet Showing Changes

REMARKS/ARGUMENTS

Drawings

The drawings are objected to by the Examiner because the label for reference number 104 of FIG. 4 requires a spelling correction. "Smooth the Normalized Raw Image Date" should read "Smooth the Normalized Raw Image Data". In other words, the word "Date" should be "Data." FIG. 4 is amended accordingly. A replacement drawing sheet is attached. An annotated drawing sheet showing the change is also attached.

Claims

In the claims, claims 1-31 are pending in the present application.

Claim Rejections – 35 U.S.C. § 102

Claims 1-21 and 26-31 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,208,763 to Avinash. Applicant respectfully traverses this rejection.

The present application discloses a system and method of improving the displayed image quality of X-ray images by reducing noise at highly attenuated regions without affecting the image contrast at relatively low attenuated regions. This system and method adaptively reduces noise within an X-ray image based on raw image data acquired prior to display processing.

The system and method of the present application includes receiving raw image data from an X-ray detector representing detected X-rays from an object undergoing an X-ray examination; creatinging a counts-based modulation mask from the raw image data representing a weighting function based on absolute detected intensities (pixel intensities) while including the effects of

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imaging system gain; performing structure analysis and deriving a structure dependent noise filtered image using the raw image data; deriving a conditioned structured mask from the structure analysis and blending the structure dependent noise filtered image and the raw image data by modulating the blending values at each pixel location using the counts-based modulation mask and the conditioned structured mask.

The creation of the counts-based modulation mask involves assigning each pixel location in the raw image a "weight" based on the counts (detector signal level or pixel intensity) at that location. The structure analysis in conjunction with the counts (pixel intensities) represented in the raw image data are utilized to create the conditioned structured mask. Finally, intensity matching may be applied to the blended image (derived from the raw image and the structure dependent noise filtered image) to equalize the intensity levels of the noise reduced output image with the raw image.

Independent claim 1 recites a method of acquiring raw image data from an X-ray detector; generating a counts-based modulation mask based on the raw image data; generating a structure dependent noise filtered image based on the raw image data; and generating a noise reduced image based on the counts-based modulation mask and the structure dependent noise filtered image. None of these elements are disclosed in the cited Avinash reference.

Applicant believes that the Examiner has misunderstood the meaning of "counts-based modulation mask" as used in the present application. There is a substantial difference between the meaning of "counts" as used in the present application and as used in the Avinash reference. In the present application, "counts" are pixel intensities of a raw image. A raw image is an X-ray

image acquired on the X-ray detector without any processing. And raw data as used in the present application is X-ray image data taken directly from an X-ray detector of an X-ray imaging system prior to performing any image processing on the X-ray image data.

In the Avinash reference, the word "counts" or "X-ray counts" are used for counting some derived data bins, not acquired data. In other words, "counts" or " X-ray counts" are not directly acquisition based. The Avinash reference does not describe an acquisition based count adaptive process.

With further reference to claim 1, the Examiner states that the method of adaptively reducing noise within an x-ray image and receiving raw data from an x-ray detector representing a detected x-ray signal from an object is disclosed in the Avinash reference between line 18 of column 3 to line 13 of column 4, and in Figure 1. This statement is incorrect. The above cited disclosure and Figure 1 in the Avinash reference refers to a magnetic resonance imaging system and not an X-ray imaging system as disclosed in the present application. The claims of the present application refer to raw data of X-ray images acquired from an X-ray imaging system.

The Examiner further states that the step of generating a counts-based modulation mask in response to said raw data is disclosed in the Avinash reference between line 66 of column 8 to line 34 of column 10 *wherein a mask is created based on counts and gradient orientation.* Applicant is unsure of the Examiner's use of the phrase *"wherein a mask is created based on counts and gradient orientation,"* since it is not found in the present application nor in the Avinash reference. The generation of the counts-based modulation mask is based on raw image data, that is image data taken directly from an X-ray detector without any processing. The

creation of the counts-based modulation mask involves assigning each pixel location in the raw image a "weight" based on the counts (pixel intensity) at that location.

The Examiner further states that the step of generating a structure dependent noise filtered image in response to said raw data is disclosed in the Avinash reference between line 56 of column 4 to line 65 of column 6, and step 66 of Figure 3. Again, this is incorrect. The step of generating a structure dependent noise filtered image in response to said raw data involves performing structure analysis and deriving a structure dependent noise filtered image using the raw image data. The Avinash reference does not disclose using acquired raw image data.

The Examiner further states that the step of generating a noise reduced image in response to said counts-based modulation mask and said structure dependent noise filtered image is disclosed in the Avinash reference in columns 10 through 12, and steps 70 and 72 of Figure 3. Applicant is unsure of the Examiner's use of the phrase *"Utilizing the structure, counts, and connectivity the image is filtered in steps 70 and 72 of figure 3,"* since it is not found in the present application nor in the Avinash reference.

Therefore, Applicant believes that independent claim 1 contains patentable subject matter, and is thus allowable.

Claims 2 and 3 are dependent claims, dependent upon independent claim 1, and thus should be allowable for the above reasons as well as for the additional elements they contain.

The method of claim 4 includes generating a counts-based modulation mask based on raw image data and a structure gradient mask based on raw image data for generating a noise reduced

image. The Avinash reference does not teach or suggest using raw image data acquired from an X-ray detector.

Claims 5-21 and 26 are dependent claims, dependent upon independent claim 4, and thus should be allowable for the above reasons as well as for the additional elements they contain.

The computer processing system of claim 27 includes a processor receiving raw image data and generating a counts-based modulation mask based on the raw image data for generating a noise reduced image. Again, the Avinash reference does not teach or suggest using raw image data acquired from an X-ray detector.

Claims 28 and 29 are dependent claims, dependent upon independent claim 27, and thus should be allowable for the above reasons as well as for the additional elements they contain.

The X-ray system of claim 30 includes a controller generating a counts-based modulation mask based on raw image data, a structure gradient mask based on raw image data, and a structure dependent noise filtered image based on raw image data for generating a noise reduced image. The Avinash reference does not teach or suggest using raw image data acquired from an X-ray detector.

Claim 31 is a dependent claim, dependent upon independent claim 30, and thus should be allowable for the above reasons as well as for the additional elements it contains.

Accordingly, claims 1-21 and 26-31 are believed to be allowable. Withdrawal of the rejection under 35 U.S.C. § 102(b) and allowance of claims is respectfully requested.

Allowable Subject Matter

Claims 22-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant appreciates the allowance of claims 22-25 if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, the Applicant believes that theses claims contain patentable subject matter and are allowable as written.

Therefore, in view of the remarks presented above, claims 22-25 should be allowable, and allowance of these claims is respectfully requested.

Conclusion

In view of the amendments and remarks/arguments presented above, the Applicant believes that the application is now in condition for allowance, and respectfully requests reconsideration of the application, withdrawal of the rejections, and allowance of the claims. The Applicant respectfully requests that the Examiner telephone the undersigned in the event a telephone conference would be helpful in advancing prosecution of the application towards allowance.

The Director is hereby authorized to charge any additional fees, which may be required in this application, or credit any overpayments, to Deposit Account No. 070845. If any extensions of time are needed for timely acceptance of papers submitted herewith, the Applicant hereby petitions for such extension under 37 C.F.R. § 1.136 and authorizes payment of any such extension fees to Deposit Account No. 070845.

Respectfully submitted,

Dated: January 14, 2008

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Attachments